

Claim Amendments

This listing of claims replaces all prior versions and listings of claims in the application.

1.-19. (Canceled)

20. (Previously Presented) A demulsification arrangement usable with a power source to remove a microwave-absorptive material from a substrate, the demulsification arrangement comprising:

a containment structure defining a treatment volume and adaptable to receive an emulsion comprising the microwave-absorptive material and the substrate;

outside the containment structure, a radio frequency (RF) generator connectable to the power source and configured to generate an RF signal; and

inside the containment structure and surrounded by the emulsion within the treatment volume, an RF applicator operatively coupled to the RF generator to deliver microwave energy outwardly from the RF applicator into the treatment volume, the RF applicator comprising

an antenna body having a longitudinal axis, the antenna body being tapered in width perpendicular to the longitudinal axis, and a length and an outer surface defining a plurality of slots of continuously varying slot width that are substantially parallel to each other, the slots being distributed evenly along and substantially perpendicular to the longitudinal axis, and

an RF transparent antenna enclosure, not in contact with the containment structure, formed around the antenna body to substantially seal the antenna body from the entire treatment volume external to the RF applicator;

whereby, when the containment structure contains the emulsion and the RF applicator, and the RF applicator delivers the microwave energy into the treatment volume, the microwave-absorptive material and the substrate are demulsified.

21. (Canceled)
22. (Canceled)
23. (Previously Presented) The demulsification arrangement of claim 20, wherein the antenna body comprises a plurality of walls forming a rectangular cross-section.
24. (Previously Presented) The demulsification arrangement of claim 20, wherein the slots are defined by each of two parallel walls.
25. (Previously Presented) The demulsification arrangement of claim 20, wherein the antenna body comprises two walls formed from an RF opaque material.
26. (Previously Presented) The demulsification arrangement of claim 25, wherein the walls are formed from aluminum.
27. (Canceled)
28. (Previously Presented) The demulsification arrangement of claim 20, wherein the RF applicator further comprises an RF transparent window arrangement disposed proximate the outer surface of the antenna body and arranged to cover the plurality of slots.
29. (Previously Presented) The demulsification arrangement of claim 28, wherein the RF transparent window arrangement comprises a plurality of RF transparent windows formed from a material having a low dielectric constant.
30. (Previously Presented) The demulsification arrangement of claim 29, wherein the RF transparent windows are formed from a material selected from the group consisting of fiberglass and TEFLON® polytetrafluoroethylene.
31. (Previously Presented) The demulsification arrangement of claim 20, wherein the antenna enclosure is formed from a material having a low dielectric constant.
32. (Previously Presented) The demulsification arrangement of claim 20, wherein at least some of the slots have sizes that increase with increasing distance

from the RF generator.

- 33. (Previously Presented) The demulsification arrangement of claim 20, wherein the antenna enclosure is formed from fiberglass.
- 34. (Canceled)
- 35. (Previously Presented) The demulsification arrangement of claim 20, wherein the RF applicator further comprises a cap coupled to an end of the antenna body located distally from the RF generator.
- 36. (Previously Presented) The demulsification arrangement of claim 35, wherein the cap is arranged to reflect an RF signal propagated within the antenna body to generate constructive interference.
- 37. (Previously Presented) The demulsification arrangement of claim 35, wherein the cap is formed from aluminum.
- 38. (Previously Presented) The demulsification arrangement of claim 20, wherein the antenna body comprises first and second faces that are spaced apart from one another and in which the slots are formed, the slots being arranged so as to radiate the microwave energy over substantially less than a 360° arc outward from the RF applicator.
- 39. (Previously Presented) The demulsification arrangement of claim 20, further comprising a control arrangement operatively coupled to the RF generator.
- 40. (Previously Presented) The demulsification arrangement of claim 20, further comprising an outlet port formed on the container.
- 41. (Previously Presented) The demulsification arrangement of claim 20, wherein the microwave-absorptive material comprises a hydrocarbon.
- 42. (Previously Presented) The demulsification arrangement of claim 20, wherein the substrate comprises water.

43. (Previously Presented) A demulsification arrangement usable with a power source, the demulsification arrangement comprising:

a radio frequency (RF) generator connectable to the power source and configured to generate an RF signal;

a control arrangement configured to be operatively coupled to the RF generator to control generation of the RF signal; and

a radio frequency (RF) applicator operatively coupled to the RF generator, the RF applicator being positionable within a treatment volume containing an emulsion comprising a microwave-absorptive material and a substrate, the RF applicator comprising

an antenna body having a longitudinal axis, the antenna body being tapered in width perpendicular to the longitudinal axis, and a length and an outer surface defining a plurality of slots of continuously varying slot width that are substantially parallel to each other, the slots being distributed evenly along and substantially perpendicular to the longitudinal axis, and

an RF transparent antenna enclosure formed around the antenna body to substantially seal the antenna body from the entire treatment volume external to the RF applicator;

whereby, when the control arrangement, the RF applicator, and the RF generator are operatively coupled and the RF applicator transmits the RF signal into the treatment volume, the microwave-absorptive material and the substrate are demulsified.

44. (Canceled)

45. (Canceled)

46. (Previously Presented) The demulsification arrangement of claim 43, wherein the antenna body comprises a plurality of walls forming a rectangular cross-section.

47. (Previously Presented) The demulsification arrangement of claim 43, wherein the slots are defined by each of two parallel walls.
48. (Previously Presented) The demulsification arrangement of claim 43, wherein the antenna body comprises two walls formed from an RF opaque material.
49. (Previously Presented) The demulsification arrangement of claim 48, wherein the walls are formed from aluminum.
50. (Canceled)
51. (Previously Presented) The demulsification arrangement of claim 43, wherein the RF applicator further comprises an RF transparent window arrangement disposed proximate the outer surface of the antenna body and arranged to cover the plurality of slots.
52. (Previously Presented) The demulsification arrangement of claim 51, wherein the RF transparent window arrangement comprises a plurality of RF transparent windows formed from a material having a low dielectric constant.
53. (Previously Presented) The demulsification arrangement of claim 52, wherein the RF transparent windows are formed from a material selected from the group consisting of fiberglass and TEFLON® polytetrafluoroethylene.
54. (Previously Presented) The demulsification arrangement of claim 43, wherein the antenna enclosure is formed from a material having a low dielectric constant.
55. (Previously Presented) The demulsification arrangement of claim 43, wherein at least some of the slots have sizes that increase with increasing distance from the RF generator.
56. (Previously Presented) The demulsification arrangement of claim 43, wherein the antenna enclosure is formed from fiberglass.
57. (Canceled)
58. (Previously Presented) The demulsification arrangement of claim 43,

wherein the RF applicator further comprises a cap coupled to an end of the antenna body located distally from the RF generator.

- 59. (Previously Presented) The demulsification arrangement of claim 58, wherein the cap is arranged to reflect an RF signal propagated within the antenna body to generate constructive interference.
- 60. (Previously Presented) The demulsification arrangement of claim 59, wherein the cap is formed from aluminum.
- 61. (Previously Presented) The demulsification arrangement of claim 43, wherein the microwave-absorptive material comprises a hydrocarbon.
- 62. (Previously Presented) The demulsification arrangement of claim 43, wherein the substrate comprises water.
- 63. (Previously Presented) The demulsification arrangement of claim 43, wherein the treatment volume comprises one of an underground treatment volume and an above-ground contained treatment volume.
- 64. (Previously Presented) The demulsification arrangement of claim 63, wherein the above-ground contained treatment volume comprises a container to receive the emulsion, the container having at least one outlet port defined by a wall of the container.
- 65. (Previously Presented) The demulsification arrangement of claim 64, wherein the outlet port is configurable between an untapped configuration while the RF applicator delivers the microwave energy into the treatment volume and a tapped configuration after the emulsion is demulsified.
- 66. (Previously Presented) The demulsification arrangement of claim 64, wherein the outlet port is configurable between an untapped configuration while the RF applicator delivers the microwave energy into the treatment volume and a tapped configuration after the emulsion is demulsified.
- 67. (Previously Presented) The demulsification arrangement of claim 43, wherein the antenna body comprises first and second faces that are spaced apart from one another and in which the slots are formed, the slots being arranged so as

to radiate the microwave energy over substantially less than a 360° arc outward from the RF applicator.

68. (Previously Presented) A demulsification arrangement usable with a power source to remove a microwave-absorptive material from a substrate, the demulsification arrangement consisting essentially of:

a radio frequency (RF) generator connectable to the power source and configured to generate an RF signal; and

an RF applicator operatively coupled to the RF generator and positionable wholly within and surrounded by a treatment volume containing an emulsion comprising the microwave-absorptive material and the substrate to deliver microwave energy outwardly from the RF applicator into the treatment volume, the RF applicator comprising

an antenna body having a longitudinal axis, the antenna body being tapered in width perpendicular to the longitudinal axis, and a length and an outer surface defining a plurality of slots of continuously varying slot width that are substantially parallel to each other and substantially uniformly spaced apart from one another along the length of the antenna body, and

an RF transparent antenna enclosure formed around the antenna body to substantially seal the antenna body from the treatment volume surrounding and external to the RF applicator;

whereby, when the containment structure contains the emulsion and the RF applicator delivers the microwave energy into the treatment volume, the microwave-absorptive material and the substrate are demulsified.

69. (Previously Presented) The demulsification arrangement of claim 68, wherein the slots are substantially perpendicular to the longitudinal axis.
70. (Previously Presented) The demulsification arrangement of claim 68, wherein at least some of the slots have slot widths that increase with increasing distance from the RF generator.

71. (Previously Presented) The demulsification arrangement of claim 68, further comprising a tube into which the RF applicator is inserted.
72. (Previously Presented) The demulsification arrangement of claim 68, in which the treatment volume is a geologic formation containing oil shale, tar sand, or ground water contamination.
73. (Previously Presented) The demulsification arrangement of claim 20, further comprising a tube into which the RF applicator is inserted.
74. (Previously Presented) The demulsification arrangement of claim 20, in which the treatment volume is a geologic formation containing oil shale, tar sand, or ground water contamination.
75. (Previously Presented) The demulsification arrangement of claim 43, further comprising a tube into which the RF applicator is inserted.
76. (Previously Presented) The demulsification arrangement of claim 43, in which the treatment volume is a geologic formation containing oil shale, tar sand, or ground water contamination.